

$$Q = \frac{\pi R^4}{8\mu L} [(p_1 + \rho g z_1) - (p_2 + \rho g z_2)] \quad j = \frac{f}{D} \frac{v^2}{2g} \quad \Re_e = \frac{vD}{\nu} \quad f = \frac{64}{\Re_e} \quad \frac{1}{\sqrt{f}} = -2 \log \left[ \frac{\epsilon}{3.7D} + \frac{2.51}{\Re_e \sqrt{f}} \right]$$

$$v = C \sqrt{R} j \quad C = \frac{87\sqrt{R}}{\gamma + \sqrt{R}} \quad C = \frac{100\sqrt{R}}{m + \sqrt{R}} \quad v = K R^{2/3} j^{1/2} \quad j = 1.21 \times 10^{10} \left[ \frac{Q}{CH} \right]^{1.852} D^{-4.87}$$

$$v = 146.2 R^{5/7} j^{4/7} \quad h_s = \zeta_s \frac{v^2}{2g} \quad \zeta = \left( 1 - \frac{A_1}{A_2} \right)^2 \quad NPSH_{disponivel} = \frac{p_{atm}}{\gamma} + (z_o - z_B) - \frac{v_{asp}^2}{2g} - \Delta H_T - \frac{e_s}{\gamma}$$

$$F = \frac{1}{m+1} + \frac{1}{2N} + \frac{\sqrt{m-1}}{6N^2} \quad F(\alpha) = \frac{NF - (1-\alpha)}{N - (1-\alpha)} \quad e_s = 610.8 \exp(17.27t / (237.3+t))$$

$$Q_{eq} = Q_{saida} + 0.55 Q_{servi}$$

$$R = \frac{A}{P} = \frac{bh + mh^2}{b + 2h\sqrt{1+m^2}} \quad \theta = 360^\circ - 2 \cos^{-1} \left( \frac{h-r}{r} \right) \quad A = \frac{(\theta - \text{sen } \theta) r^2}{2} \quad P = r\theta$$

$$\bar{K} = \left( \frac{P}{\sum \frac{P_i}{K_i^{3/2}}} \right)^{2/3} \quad h_c = \sqrt[3]{q^2 / g} \quad v_c = \sqrt{gh_c}$$

$$\frac{Q}{\sqrt{g}} = \frac{[(b+mh)h]^{1.5}}{\sqrt{b+2mh}} \quad v_c = \sqrt{gh_{mc}} \quad E_c = h_c + \frac{h_{mc}}{2} \quad h_m = \frac{(b+mh)h}{b+2mh}$$

$$\frac{h_1}{h_2} = \frac{1}{2} \left[ -1 + \sqrt{1 + \frac{8q^2}{g h_2^3}} \right] = \frac{1}{2} \left[ -1 + \sqrt{1 + \frac{8v_2^2}{g h_2}} \right] \quad \Delta h = \frac{(h_2 - h_1)^3}{4h_1 h_2} \quad L = 6.9 (h_2 - h_1)$$

$$\frac{h_2}{h_1} = \frac{1}{2} \left[ -1 + \sqrt{1 + \frac{8q^2}{g h_1^3}} \right] = \frac{1}{2} \left[ -1 + \sqrt{1 + \frac{8v_1^2}{g h_1}} \right]$$

$$Q = k c A_o \sqrt{2gH} \quad c' = c \left( 1 + \lambda \frac{U'}{U} \right) \quad Q = A_o \sqrt{2gh_p} \quad Q = c A_o \sqrt{2g\delta}$$

$$Q = \frac{c}{\sqrt{1-\beta^4}} A_o \sqrt{\frac{2\Delta p}{\rho}} \quad \beta = \frac{d_o}{D} \quad Q = \frac{2}{3} c b \sqrt{2g} \left[ (H_2 - H_o)^{3/2} - (H_1 - H_o)^{3/2} \right]$$

$$Q = C b \sqrt{2gH^3} \quad C = \left( 0.405 + \frac{0.003}{H} \right) \left[ 1 + 0.55 \left( \frac{H}{H+A} \right)^2 \right] \quad C = 0.41 \left( 1 + \frac{1}{1000H+1.6} \right) \left[ 1 + 0.5 \left( \frac{H}{H+A} \right)^2 \right]$$

$$Q = 1.83(b - 0.2H) H^{3/2}$$

$$Q = 1.38 H^{5/2} \quad \text{para } H < 0.18 \text{ m} \quad Q = 1.46 H^{5/2} \quad \text{para } H > 0.18 \text{ m} \quad Q = 1.86 b H^{3/2} \quad Q = 1.7 b H^{3/2}$$